**Photosynthesis Overview**

Converts light energy into sugars (stored energy)

*Occurs in plants and algae*

sunlight

6 H2O + 6 CO2 C6H12O6 + 6 O2

**Light-dependent rxns:** Electron Transport Chain and Chemiosmosis(occur in thylakoid membrane)

Summary: **uses light energy to create NADPH and ATP**

Steps:

Photosystem II

* + - * light (photons) energizes e-s in chlorophyll, e-s enter ETC
      * H2O split into H+ and e-s (replace those just lost from chlorophyll)

ETC

* + e-s travel through proteins in membrane; as move release energy which pumps H+ across membrane into the thylakoid (creating [high] of H+)

Photosystem I

* + light (photons) energizes e-s in chlorophyll, e-s and H+ added to NADP+ to make NADPH

ATP production

* + H+ diffuse through ATP synthase (move from inside thylakoid where they are in [high] to the stoma where they are in [low]) which cause P to be added to ADP to make ATP

**Calvin Cycle** (occurs in stroma)

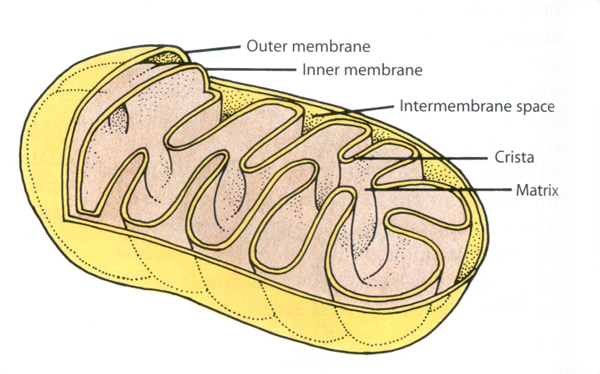
Summary: **uses CO2 and ATP and NADPH (made in in L-D rxns) to create C-molecules (sugars)**

Steps:

* + - * CO2 enters cycle. Series of breakdowns of different size C-molecules using energy from ATP and NADPH.
      * One high-energy 3-C molecule, G3P, leaves each cycle; will be used to create sugar (ex. glucose). One G3P remains in cycle to be used again.

**Cellular Respiration Overview**

Converts sugar (sometimes fats or proteins too) into ATP, usable cellular energy

*Occurs in plants, animals, fungi, protists*

C6H12O6 + 6 O2 ATP + 6 CO2 + 6 H2O

**Glycolysis** (occurs in cytoplasm – not in mitochondria)

Summary: glucose broken down into pyruvate (3-C molecule); ATP and NADH also made; no O2 needed

**Krebs Cycle** (occurs mitochondrial matrix)

Summary: **breaks down C-molecules to create into NADH, FADH2,** ATP and CO2(released as waste)

Steps:

* Before Krebs:
  + Pyruvate brown down to 2-C molecule; CO2 released
  + Coenzyme A bonds to 2-C molecule create acetyl CoA
* Acetyl CoA enters Krebs Cycle, added to 4-C molecule to create citric acid (6-C molecule)
* Citric acid broken down. NADH made. CO2 released
* Break down of C-molecules continues making NADH, FADH2, ATP, and CO2

**Oxidative Phosphorylation: Electron Transport Chain and Chemiosmosis** (occurs in inner membrane of mitochondria)

Summary: **energy from NADH & FADH2 (made in Krebs) used to create lots of ATP** (approx.. 34)

Steps:

* e-s lost from NADH and FADH2 travel through proteins in membrane; as e-s move energy released which pumps H+ across membrane into the intermembrane space
* O2 accepts final e-s in ETC and picks up H+ that diffused into the matrix to form H2O
* H+ diffuse through ATP synthase (move from intermembrane space where they are in [high] to the matrix where they are in [low]) which cause P to be added to ADP to make ATP